had an especial attraction for him. His last thoughts were concerning the distribution of the prime numbers; the excellent paper in which he contracted Tchebycheff's limits was a source of great satisfaction to him, and shortly before he died he was hopeful of being able to prove the Goldbach-Euler conjecture that every even number can be partitioned into two primes; but in this he was not successful, although he was able to narrow the issue, and to give a more precise statement of the supposed theorem. At one time he was interested in the construction of tessellated pavements; one anallagmatic design was, through the influence of his friend Colonel Yelverton, put down in the hall of the Junior United Service Club in Charles Street, Haymarket. Some years ago it was unfortunately removed whilst the hall was undergoing repair.

His writings are flowery and eloquent. He was able to make the dullest subject bright, fresh, and interesting. His enthusiasm is evident in every line. He would get quite close up to his subject, so that everything else looked small in comparison, and for the time would think and make others think that the world contained no finer matter for contemplation. His handwriting was bad, and a trouble to his printers. His papers were finished with difficulty. No sooner was the manuscript in the editor's hands than alterations, corrections, ameliorations and generalisations would suggest themselves to his mind, and every post would carry further directions to the editors and printers. His usual custom was to send early notice of his discoveries to the Academy of Sciences in Paris. Subordinate theorems he would despatch at once to the *Educational Times*. He frequently also made announcements in the columns of NATURE. He gave so many names to mathematics that he used playfully to speak of himself as the Mathematical Adam. It has been remarked by Prof. Forsyth that he drew almost entirely upon Latin for new names, whilst Cayley as invariably drew upon Greek. In 1870 he published "The Laws of Verse," dedicating it to Matthew Arnold. The composition of sonnets, both in English and Latin, was a relaxation that he much enjoyed; these have been, and no doubt will be, criticised in other places.

He was fond of billiards, whist and chess. He liked occasionally going into the society of ladies, but was never married.

He appears in the series of portraits of Scientific Worthies for the year 1889, to the accompaniment of a sympathetic notice from the pen of Cayley. His portrait in oils, by Elmslie, was exhibited in the Royal Academy a few years ago, and now hangs in the hall of St. John's College, Cambridge. His physiognomy was striking, never failing to impress deeply at a first meeting. Latterly his appearance was venerable and patriarchal.

In this short notice justice cannot be done to his character. His temper was somewhat quick on occasions, but he never cherished angry feelings beyond a very short time; he was anxious to forget and forgive. Only those who understood him were aware that anger or displeasure was with him a transient phenomenon, and that charitableness of feeling and kindness of heart were characteristics deeply engraved upon his nature. To younger men he was sympathetic and generous.

The revival of the mathematical reputation of England, dating from the Queen's accession to the throne, is to a large degree due to his genius; and those who were present on March 19, at the simple, yet impressive ceremony at the Jewish cemetery at Dalston, must have realised that one of the giants of the Victorian era had been laid to rest. The Royal Society and the London Mathematical Society were represented at the funeral by Prof. Michael Foster, Sec.R.S., Major MacMahon, R.A., F.R.S., Prof. Forsyth, F.R.S., Prof. Elliott, F.R.S., Dr. Hobson, F.R.S., Prof. Greenhill, F.R.S., Mr. A. B. Kempe, F.R.S., and Mr. A. H. Love, F.R.S. There were also present Prof. Turner and the Sub-Warden of New College, Oxford.

P. A. MACMAHON.

## NOTES

A MEETING of Presidents of various scientific societies in London was recently convened by the President and Officers of the Royal Society, to consider whether any, and if so what, steps should be taken to commemorate the sixtieth year of Her Majesty's reign. It was unanimously resolved—"That a fund to be called the Victoria Research Fund be established, to be administered by representatives of the various scientific societies, for the encouragement of research in all branches of science." The President of the Royal Society has communicated this resolution to the scientific societies, with a letter asking whether support would be given to it.

AT the recent anniversary meeting of the Royal Irish Academy, Prof. Albert von Kölliker and M. A. Michel Lévy were elected honorary members in the Section of Science.

THE subject of the Croonian Lecture to be delivered at the Royal Society on Thursday next, by Prof. C. S. Sherrington, is "The Mammalian Spinal Cord as an Organ of Reflex Action."

THREE sculptors—Lessing, Hertert, and Janensch—have been selected from the list of those who made application to execute the statue of Helmholtz for the Helmholtz Memorial Committee. Which of the three will be chosen to carry out the work is not yet known. The monument will stand between the statues of the two Humboldts, in the front grounds of the University of Berlin.

WE much regret to announce the death of M. Antoine T. d'Abbadie, formerly president of the Paris Academy of Sciences. In 1893 M. d'Abbadie bequeathed to the Academy, subject to a life-interest to his wife, the Abbadia estate in the Pyrenees, having an annual revenue of twenty thousand francs, and shares in the Bank of France representing an annual income of fifteen thousand francs. He published several important works on geographical exploration and geodesy, and was sent by the Academy to St. Domingo in 1882 to observe the eclipse of the sun.

THE following are the names of the members of the British Association who have been nominated by the Council as presidents of the different Sections at the forthcoming meeting at Toronto:—(A) Mathematical and Physical Science, Prof. A. R. Forsyth, F.R.S.; (B) Chemistry, Prof. W. Ramsay, F.R.S.; (C) Geology, Dr. G. M. Dawson, C.M.G., F.R.S.; (D) Zoology, Prof. L. C. Miall, F.R.S.; (E) Geography, Mr. J. Scott Keltie; (F) Economic Science and Statistics, Prof. E. C. K. Gonner; (G) Mechanical Science, Mr. G. F. Deacon; (H) Anthropology, Prof. Sir W. Turner, F.R.S.; (I) Physiology, Prof. M. Foster, Sec.R.S.; (K) Botany, Prof. H. Marshall Ward, F.R.S. The two evening discourses will be delivered by Prof. Roberts-Austen, C.B., F.R.S., and by Prof. John Milne, F.R.S.

MR. MORRIS K. JESUP, president of the American Museum of Natural History, is fitting out an elaborate anthropological expedition to undertake a seven years' tour for the study of prehistoric man in all parts of the world, at a cost estimated as over sixty thousand dollars. It will be the most elaborate and best-equipped expedition ever sent out in the interests of anthropology. Mr. Jesup has already done much for scientific research. Several years ago he fitted out one of the relief expeditions to bring back Lieut. Peary from the Arctics. He also provided funds for the expedition under Prof. Charles S. Sargent, which collected the forestry exhibit known as the Jesup Collection in the American Museum of Natural History, a very complete exhibit of different kinds of wood in the United States. The expedition now contemplated will be led by Prof. F. W. Putnam, the veteran anthropologist, for a long time curator of the Peabody Anthropological Museum at Harvard University, and secretary of the American Association for the Advancement of Science. He will be assisted by Dr. Franz Boas, who has spent several years among the Indian tribes in the north-west of America, and by a corps of assistants. The plan is to proceed first to the north-west coast of North America, north of British Columbia, following the coast up to Alaska and Bering Strait. Thence the party will cross into Asia, and work down to Siberia, to China, along the Indian Ocean, and into Egypt.

A PUBLIC meeting to promote the National Jenner Memorial will be held in the theatre of the University of London, on Wednesday, March 31, at 4 p.m. The chair will be taken by the Duke of Westminster, K.G., and among those who will address the meeting will be Lord Herschell, Lord Playfair, Lord Lister, and Prof. Michael Foster.

PHYSICISTS who will be in Paris during Easter week should endeavour to visit the exhibition of new physical experiments and apparatus at the rooms of the Société Française de Physique, 44 rue de Rennes. The exhibition will be held on Friday, April 23, and Saturday, April 24. The principal experiments brought before the Society during the past twelve months will be repeated each evening at 8 p.m.; and the apparatus will be on view during the whole of the Saturday.

WE regret to have to record the deaths of Dr. Kolbe, formerly professor of mathematics at the Technical High School at Vienna; Dr. Robert Hogg, a distinguished horticulturist, and author of numerous works on the vegetable kingdom and its products; M. Charles Contejean, a young French physiologist known in the biological world by some important researches; Mr. Lorenzo N. Johnson, formerly instructor in botany in the University of Michigan; Prof. John Pierce, formerly professor of chemistry in Brown University, U.S.; and Mr. John Biddulph Martin, the president of the Royal Statistical Society, and a member of several other scientific societies.

AN instance of the solicitude shown by Government departments in Germany towards University professors is related by the Berlin correspondent of the *British Medical Journal*. It appears that Prof. Kayser, the successor of Hertz as Director of the Physical Institute in the University of Bonn, is invalided, and his symptoms seem to point to influences from insanitary surroundings. In consequence, the Prussian Cultus-Minister ordered a thorough examination into the institute building. Prof. Finkler, of Bonn, and Prof. Proskauer, Assistant at the Berlin Koch Institute, have been entrusted with the work, and will submit proposals for alterations, or even partial rebuilding, to the Medical Department of the Ministry.

THE present year being the sixtieth of Sir George Gabriel Stokes's connection with Cambridge, the wish has been expressed that his bust should be executed by some artist of eminence, and should be preserved in the Hall of Pembroke College, Sir G. G. Stokes having been a member of that college since October 1837. A working Committee has been formed for carrying out the proposal, and Mr. Hamo Thornycroft, R.A., has expressed his willingness to undertake the work of executing the bust. The Committee are desirous, if general support is given to the project, that a replica of the bust should also be executed, and presented to the University, in which Sir G. G. Stokes has held the Lucasian Professorship for nearly fifty years. For this double purpose a sum of not less than four hundred guineas will be required, of which amount about one-third has been given or promised. Donations may be paid to the credit of the "Sir G. G. Stokes Bust Fund" at Messrs. Barclay and Co., Mortlock's Bank, Cambridge, or to either of the Secretaries, Rev. C. H. Prior, and R. A. Neil, at Pembroke College.

THE Institution of Naval Architects have made arrangement to hold an International Congress of Naval Architects and Marine Engineers at the Imperial Institute, in the course of the coming summer. The Prince of Wales has consented to act as Honorary President of the Congress, and will deliver the speech of welcome on the opening day. Invitations to take part in the Congress have been sent to the Ministers of Marine of all the principal maritime powers of the world, to the French Association Technique Maritime, to the American Society of Naval Architects and Marine Engineers. A large and representative Reception Committee is in course of formation, and the Council are receiving every encouragement from H.R.H. the Prince of Wales, from the Government, the City of London, as well as from the shipbuilding and shipowning interests throughout the country. The exact date of the Congress is not yet fixed, but the meetings will probably take place early in July.

THE Comité d'Organisation of the seventh International Geological Congress, to be held at St. Petersburg from August 29 to September 4, have received so many applications from persons who are not geologists, and yet wish to obtain free railway tickets and to participate in other advantages arranged by the Russian Government, that they have issued a special circular stating that the facilities offered are intended only for geologists. Excursion tickets will only be granted to persons who are known by their contributions to geology. Even with this restriction, the meeting promises to be a large one, for more than six hundred geologists have applied for tickets. All geologists who have paid their subscription will obtain a non-transferable ticket, giving them the right to travel first-class on the Russian and Finland railways free of cost. The excursions arranged, both to precede and succeed the meeting, include a visit to the Urals, or to Esthonia, or to Finland, before the meeting, and to the Caucasus and Crimea after the meeting.

THE work upon "The Ancient Volcanoes of Great Britain," which has engaged Sir Archibald Geikie's attention for some time, will be published in a few days by Messrs. Macmillan and Co. The subject of the former volcanoes of the British Isles has occupied much of the author's time and thought all through his active life. Born among the crags that mark the sites of some of these volcanoes, he was led in his boyhood to interest himself in their structure and history. Since that time he has taken advantage of every opportunity of extending his knowledge of the phenomena they present, by personally examining the volcanic records of our own islands, and the volcanic regions of Europe and Western America. The forthcoming work will realise a long-cherished desire to combine the materials thus accumulated into a general narrative of the whole progress of volcanic action from the remotest geological period down to the time when the latest eruptions ceased. It is dedicated to Prof. Ferdinand Fouqué and M. Michel-Lévy, and will be a very important contribution to geological literature.

DR. NANSEN was present at the meeting of the Royal Geographical Society on Monday, when a paper on "The North Polar Problem" was read by Sir Clements Markham. In the course of some remarks upon the subject of the paper, he said that he thought the most interesting and important result of the recent expedition is with regard to the extension of land and sea in the north polar region. The whole of the sea to the north of Siberia was very deep, in fact it formed a north polar basin filled with comparatively warm water, and it could be asserted with great certainty that the Pole itself must be situated in that deep sea basin. The fact that the ice was always easily drifting north, indicated that there could not be much land to the north of their route, because if there had been land it must have stopped the drift of the ice in that direction. There were, also, no land birds to be seen flying northwards, whereas if land existed to the north they would have been certain to have seen some birds of that kind. There might, however, be some small islands to the north, where the ice-drift closed in from time to time in order to get into the layers which were noticed. The oldest ice met with in the polar region was probably of five or six years of age. The ice was, on an average, from 10 feet to 12 feet deep. As to the temperature of the water of the polar sea, it was always found to be pretty constant. At the top there was a layer of about 100 fathoms thick, the temperature of which just rose above freezing point, then the temperature began to sink, and just before the bottom was reached it rose again. This fact clearly shows that warm water must run into the polar sea from the south. The warm Atlantic water comes into the sea from the Gulf Stream, and forms a warm surface current there. That is perhaps the most important fact with reference to oceanography which has resulted from Dr. Nansen's expedition. Dr. Nansen concluded his remarks by saying that what is really wanted is not merely to reach the Pole, but more scientific observations from the Arctic regions. He did not think it was difficult to reach the Pole itself. With enough dogs it was quite possible. If 200 dogs were taken, the Pole could certainly be reached; but he did not think it was worth while, and he could not see the importance of it, for they would not bring back sufficient observations, and it would be a waste of time and labour. If they wanted scientific observations from the Arctic regions, there was no better plan than the one he adopted—of going into the ice. The ship was an excellent observatory; it was possible to have all kinds of laboratories on board. If he started again, he would build a better ship than the *Fram;* and if a man were to spend five years in such a ship, he was certain to bring back observations that would pay him many times over. He would be possessed of rich material for forming a good idea of the physical conditions of the North Polar region.

The geometrical interpretation of complex quantity has hitherto been chiefly associated with the name of Argand; but it would now appear that this mathematician had been anticipated by a Norwegian named Caspar Wessel, who, on March 10 1797, communicated to the Academy of Sciences of Copenhagen a paper entitled, "Om Directionens analytiske Betegning" (on the analytic representation of direction). Caspar Wessel was a land-surveyor, who attained some distinction in his profession, but appears never to have been recognised as a mathematician; and this paper is remarkable both from being his only contribution to mathematical knowledge, and at the same time bearing distinct marks of mathematical genius. Not only did Wessel show how directed quantities could be represented in two-dimensional space by expressions involving $\sqrt{-1}$, but he also gave a theory of algebraic operations involving lines in three-dimensional space, thus anticipating Hamilton's theory of quaternions by nearly fifty years. To commemorate the centenary of the publication of this important paper, a French translation has been issued by the Danish Royal Academy, with prefaces by MM. H. Valentiner and T.-N. Thiele.

Referring to the plague in India, the *Lancet* remarks that the reports are, on the whole, more hopeful and promising, those from Bombay city showing a decided improvement. The total plague returns for Bombay city up to the 11th inst. amount to 9032 cases and 7546 deaths. The week's mortality from all causes in Bombay was 1326, as compared with 1484 in the previous week; and the returns for the whole Presidency since the outbreak of the plague up to the 6th inst. amount to 14,856 cases and 12,204 deaths. It will be remembered that many persons were disposed to think that there was some connection between the outbreak of plague and the storage of grain, and Surgeon-Colonel Waters some time ago gave an interesting account of his researches into the origin of plague, in which he adverted to the rat murrain that had been noticed in several of the outbreaks of bubonic disease, and to the plausible hypothesis that the disease might be connected with something affecting the granaries and the storage of the cheaper varieties of grain and millet. Mr. Hankin reports, however, that he has examined a large number of specimens of grain and flour under various conditions, but has been unable to detect the plague microbe in any of them, and that his examination of weevils and of other parasitic insects has also been with negative results. M. Haffkine has been busily occupied in developing a prophylactic and antitoxic serum. It is yet too early to pronounce any opinion on their efficacy, but the antitoxic curative serum has already been tried in many cases of plague with, so far, promising results. Dr. Yersin has prepared a stock of antitoxic serum, and we shall soon know whether the results obtained in India are confirmatory of those which were obtained, by others and himself, in China.

The Agricultural Research Association does good service by disseminating trustworthy and useful information on agricultural subjects by means of scientific investigation. From the report, just received, we learn that the work done in 1896 was concerned chiefly with the cultivation of oats and the grass crop. With regard to the "dressing" or selection of oats for seed, it has been proved by experiment that, contrary to what might have been anticipated, large seeds afford no ground for expectation of the production of large ultimate plants or heavier crops, nor do they secure any earlier germination. What they do secure is power to reach the surface though deeply deposited, and a stronger briard, which will enable the plants to withstand uncongenial conditions of soil or season at the early stage of growth. The subject was further followed up to find why a large seed does not necessarily tend to produce a large plant. By this inquiry the fact has been found, by an investigation, that the size and strength of the embryo plant within the seed does not bear any relation to the size of the seed; small seeds may often contain larger or stronger embryos than a large seed; the extra size of the seed indicates merely the provision of extra food for the embryo. The production of a strong embryo probably depends rather on the parental influence, a circumstance which opens up an interesting subject that seems worthy of investigation, and one which might be expected to give results of practical value. Other work of the Committee refers to the proper time for harvesting oats, and the cultivation of suitable grasses. It is suggested that grass should lie longer than has hitherto been the practice. The Hon. Secretaries of the Association are:—Mr. Ranald Macdonald, Factor, Cluny Estates; Mr. John Milne, Mains of Laithers, Turriff. The Director of Research is Mr. Thomas Jamieson, 173 Union Street, Aberdeen.

The presentation of the Albert Medal of the Society of Arts to Prof. D. E. Hughes, F.R.S., has induced our worthy contemporary—*Invention*—to disinter from the past the early history of the microphone. This instrument was invented in December 1877, and was first shown privately, in February 1878, to the officials of the Submarine Telegraph Company. The first demonstration of the discovery was made on May 2, 1878, at

Prof. Hughes' rooms. "Upon that occasion," remarks our contemporary (March 6), "besides the professor, there were present the late Prof. Huxley, Prof. Norman Lockyer, Mr. W. H. Preece, Mr. Conrad W. Cooke, and Mr. Perry F. Nursey. It is an idiosyncrasy with Prof. Hughes that his remarkable inventions have all been worked out with the most simple and commonplace tools. Thus on the occasion referred to the apparatus was of the most primitive character, and, with the exception of a Bell telephone receiver, could not be appraised at more than a few pence. This apparatus had a child's halfpenny wooden money-box for a resonator, on which was fixed by means of sealing-wax a short glass tube, filled with a mixture of tin and zinc, the ends being stopped by two pieces of charcoal to which were attached wires, having a battery of three small Daniell cells—consisting of three small jam-pots—in circuit. The wires were led away to a Bell telephone placed in an adjoining apartment. The money-box, which had one end knocked out, served as a mouthpiece or transmitter, while a Bell telephone was used as a receiver. Sounds scarcely audible, and some absolutely inaudible, to the unassisted ear, were by means of this apparatus delivered with startling loudness through the Bell telephone. Numerous experiments of the utmost importance to physicists were carried out by Prof. Hughes with this apparatus, and with modifications of it, all proving that he had succeeded in producing the simplest and most powerful electric articulating telephone ever known." The first public demonstration of the sensitiveness of the instrument took place at the Royal Society on May 8, 1878.

The Royal Meteorological Society has for many years past held an exhibition annually, which has been devoted to some special class of meteorological instruments. This year an exhibition of meteorological instruments in use in 1837 and 1897 was arranged, in commemoration of the Diamond Jubilee of H.M. the Queen. The exhibition closed on Friday last. The instruments which were in use in 1837, as might be supposed, were not very numerous, but many of them were somewhat quaint and of great interest. Sir E. H. Verney, Bart., showed an old barometer with a large spirit thermometer, which latter had an arbitrary scale decreasing as the temperature increases, "extream cold" being 90° and "extream hot" 0°. The instruments in use during 1897 were, however, very numerous, and comprised various forms of barometers, thermometers, hygrometers, rain-gauges, anemometers, nephoscopes, sunshine recorders, actinometers, aneroids, electrical and miscellaneous instruments. Many of the instruments were self-recording, and were shown in action. The most interesting exhibit was a railed-off enclosure representing a typical climatological station of the Royal Meteorological Society. This included a Stevenson thermometer screen, fitted with dry bulb, wet bulb, maximum and minimum thermometers; rain-gauge; solar and terrestrial radiation thermometers; sunshine recorder, and earth thermometer; all of which were placed *in situ*. The exhibition also included a number of charts and photographs of great interest, particularly those by Mr. J. Leadbeater, of ice crystals on window-panes. Mr. W. H. Dines showed an experiment illustrating the formation of the tornado cloud, and Mr. Birt Acres exhibited some exceedingly interesting studies of form and movement of clouds and waves projected on the screen by his kinematoscope.

The Mond gas-producer plant and its application, was the subject of a paper read by Mr. H. A. Humphrey at the Institution of Civil Engineers on March 16. The advantages of gaseous over solid fuel have led to an increasing demand for gas-producers to convert the solid fuel into the gaseous state. Gas-producers have hitherto been constructed to make gas with little regard to by-products, and none have been made to give good results with cheap slack coal, and where the use of gas for gas-engines has been concerned only expensive fuel, such as anthracite or coke, have been found available. But the Mond producer and recovery plant, described by Mr. Humphrey, not only employs cheap bituminous fuel, but recovers from it 90 lbs. of sulphate of ammonia per ton, and yields a gas eminently suitable for use in gas-engines and applicable to all cases of furnace work. The difficulties to be overcome before bituminous slack could be utilised in producers were many; nevertheless Dr. Ludwig Mond has not only succeeded in overcoming them, but has advanced the subject another stage by recovering as ammonia 70 per cent. of the original nitrogen contained in the fuel. The distinguishing features of the Mond process were enumerated, and the manner in which the plant is worked was described in detail.

Statistics of the United States Patent Office, just published, show an increase of about 3000 in the number of patents taken out during the last year compared with the year before. The surplus fund of revenues above expenses of the office now exceeds four million dollars.

Referring to our note on Prof. F. Plateau's experiments on the mode in which insects are attracted to flowers, Mr. G. W. Bulman calls our attention to a paper by him in the *Zoologist* (vol. xiv. 3rd series, p. 422), and to others published in *Science Gossip* between 1888 and 1892, in which he arrived at a conclusion similar to that of Prof. Plateau, viz. that the bright colour of the corolla does not act as a beacon to attract insects.

We have received the first part of the division, "Aves," of the great new German zoological work, called "Das Tierreich," which is proposed to contain a descriptive synopsis of all the recent forms in the animal kingdom. The general editor of the whole work (on behalf of the German Zoological Society) is Dr. F. E. Schulze, of Berlin. The editor of the "Aves" is Dr. A. Reichenow, but the present part of that division has been prepared by Mr. Ernst Hartert, director of the Zoological Museum of Tring. There can be no doubt as to the merit of Mr. Hartert's work, which gives all that should be contained in such a synopsis, and no more. But it is a misfortune that German patriotism has rendered it necessary to use German instead of Latin in such a work, which is of a cosmopolitan nature. Multitudes of English and American zoologists, we regret to say, are still unable to read German with any sort of facility, while every one who has been to school understands a little Latin.

About two years ago Zelinsky found that two hydrocarbons could be obtained from hexamethylene iodide by reduction, the product prepared by means of zinc and hydrochloric acid being different from that got when hydriodic acid was used. Further experiments, of which an account is given in the current number of the *Berichte*, have convinced him that the first of these is the true hexamethylene; whilst the second is identical with the methylpentamethylene, which was first prepared by W. H. Perkin, jun., and P. Freer. The hexamethylene ring, therefore, under the influence of hydriodic acid at 230° changes into a more stable isomeric form. The nature of this change is quite in agreement with Baeyer's celebrated "tension-theory," according to which the pentamethylene ring is more stable than any other. It appears probable, moreover, that the hexahydrobenzene which is formed by the action of hydriodic acid on benzene, and which has long passed for hexamethylene, is in reality methylpentamethylene.

The additions to the Zoological Society's Gardens during the past week include two Vulpine Phalangers (*Trichosurus vulpecula*, ♂ ♀) from Australia, presented by Mr. W. H. Stather; two Muscovy Ducks (*Cairina moschata*, ♀ ♀) from South

America, presented by Mrs. Dade; two Brown Mud Frogs (*Pelobates fuscus*) from Italy, presented by Count M. Peracea; an Indian Elephant (*Elephas indicus*, ♀) from India, a Rose-crested Cockatoo (*Cacatua moluccensis*) from Moluccas, deposited; a Chimachima Milvago (*Milvago chimachima*), two Violaceous Night Herons (*Nycticorax violaceus*) from South America, a Common Quail (*Coturnix communis*) captured at sea, a Common Rhea (*Rhea americana*) from South America, a Bornean Gibbon (*Hylobates muelleri*, ♀) from Borneo, purchased.

## OUR ASTRONOMICAL COLUMN.

THREE BRILLIANT STELLAR SYSTEMS.—Prof. T. J. J. See, with the aid of the 24-inch refractor of the Lowell Observatory, in Mexico, has recently discovered (*Astr. Journal*, No. 396) three objects which "may be regarded as amongst the most splendid systems in the heavens." The first, discovered in January last, is α Phœnicis, its position for 1900 being R.A. 0h. 21m. 19·5s., decl. −42° 50′ 48″·1. The primary of this double has a magnitude of 2·4, the companion being as faint as a thirteenth mag. star. This inequality, combined with the deep orange or reddish colour of α Phœnicis, renders the system both striking and difficult. The mean of some measures made for determination of the position of the components was 1897·041, pos. angle 272°·7, dist. 9″·73. The second of these objects, also a very southern star, is μ Velorum with a magnitude of nearly 3, the companion being 11, of a purplish colour and very near the large star. [R.A. 10h. 42m. 28s., decl. −48° 53′ 31″ (1900)]. This system is described as one of the most extraordinary in the heavens, and likely to have a very large orbital motion. Measurements of position gave for 1897·059, pos. angle 62°·7, dist. 2″·54. The third and last of these objects, η Centauri, situated at R.A. 14h. 29m. 10s., and decl. −41° 42′ 59″ (1900). The components are of magnitude 2·5 and 13·5, being yellow and purple in colour. The system is described as extremely difficult, requiring a powerful telescope to see it. The relative positions of the components is given for 1897·051, as pos. angle 270°·1, dist. 5″·65.

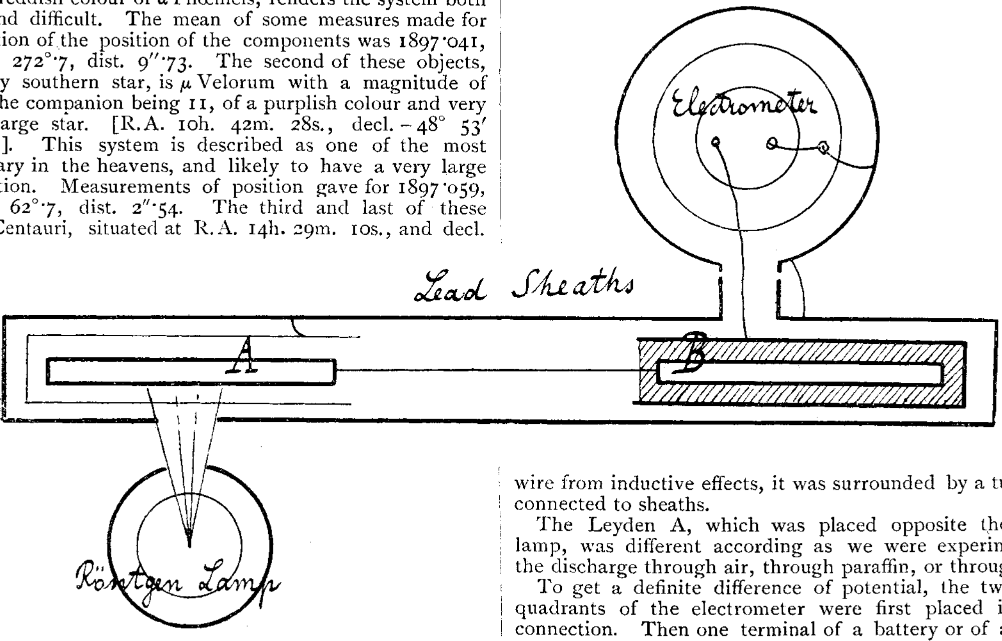
THE COMPANION TO PROCYON.—To those who wish to seek for the companion to Procyon, Prof. Schaeberle's description of the method he adopts (*Astr. Nachr.*, No. 3410) in observing this faint companion will prove of service. Owing to its very close proximity to Procyon, the companion can only be seen when the observing conditions are at their best. If a good objective be employed the aperture should not be reduced, but a cap fitted over the eyepiece is found most serviceable. For Prof. Schaeberle's measures an eyepiece magnifying 500 diameters was employed, the aperture of the cap over the eyepiece being about 1·6 millimetres. The magnitude of this companion is estimated as fully equal to a twelfth-magnitude star, and when the seeing is good it is "as easily and accurately measured as the satellite Phobos when Mars is in opposition." Sirius' companion is estimated as being two or three magnitudes brighter than that of Procyon, and is also being regularly observed at the Lick Observatory, the same means—namely, cap over the eyepiece—being employed.

## ON THE INFLUENCE OF RÖNTGEN RAYS IN RESPECT TO ELECTRIC CONDUCTION THROUGH AIR, PARAFFIN, AND GLASS.[1]

WE have in previous papers described experiments respecting electric conduction when Röntgen rays fall on metals, positively or negatively electrified to potentials of two or three volts. We found that although air is rendered conductive, paraffin and glass are not rendered sensibly conductive when the differences of potential concerned are not more than two or three volts per centimetre of air, or per centimetre of paraffin, or per half-millimetre of glass.

We have now to describe an extension of the investigation to much higher voltages, in which we use an arrangement of two (quasi) Leyden jars, A and B, with their inside coatings connected together. The outside coating of A was connected to sheaths, the outside of B to the insulated terminal of the electrometer. In all the experiments to be described, B remained the same.

It consisted of a cylindrical lead can, 25 cms. long, 4 cms. diameter. A metal bar about 1 cm. diameter, 25 cms. long, was supported centrally on paraffin filling the whole space between it and the containing lead. This metal bar was connected by a wire to the internal coating of A. To protect this wire from inductive effects, it was surrounded by a tube of lea connected to sheaths.



The Leyden A, which was placed opposite the Röntgen lamp, was different according as we were experimenting on the discharge through air, through paraffin, or through glass

To get a definite difference of potential, the two pairs of quadrants of the electrometer were first placed in metallic connection. Then one terminal of a battery or of an electrostatic inductive machine was connected to the internal coatings of the jars, and the other terminal to sheaths. The difference of potential produced was measured by a multicellular voltmeter in the case of differences under 500 volts, and on a vertical single vane voltmeter for higher differences.

When the desired difference of potential had been established, the metallic connection of the battery or electric machine with the internal coatings of A and B was broken, and this charged body left to itself. To find the loss due to imperfect insulation, the pair of quadrants in metallic connection with the outside coating of B was insulated in the ordinary way, and the deviation of the electrometer reading from the metallic zero per half-minute was observed. To find the loss when the rays were acting, the two pairs of quadrants were again placed in metallic connection, the Röntgen lamp set a-going, then the pair of quadrants connected to the outside coating of B was insulated from the other pair, and the deviation from metallic zero again observed per half-minute.

In the experiments with air, the Leyden A consisted of an aluminium cylinder, 16 cms. long, 3 cms. in diameter. This cylinder projected beyond the lead tube, and was connected to sheaths. The insulated metal inside it, which was a flat strip

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[1] By Lord Kelvin, Dr. J. Carruthers Beattie, and Dr. M. Smoluchowski de Smolan. Read before the Royal Society of Edinburgh, March 1.